

The Journal of the American Association of Zoo Keepers, Inc.

AAZK Animal Keepers' Forum



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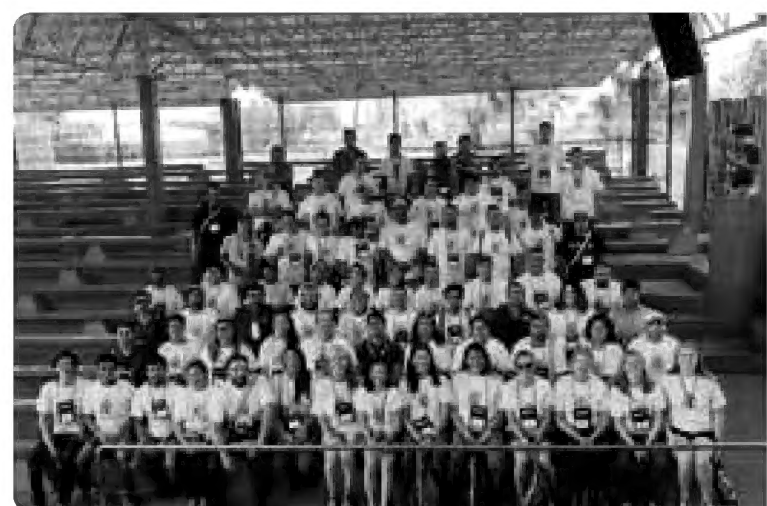
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The American Association of Zoo Keepers, Inc. exists to advance excellence in the animal keeping profession, foster effective communication beneficial to animal care, support deserving conservation projects, and promote the preservation of our natural resources and animal life.

ABOUT THE COVER

This month's cover features "Freya" an Amur Leopard (*Panthera pardus orientalis*) at Connecticut's Beardsley Zoo; photographed and submitted by Elaine Dyer. Amur leopards are suited for the cold climate of Southeastern Russia and Northeastern China with thick fur that can grow up to seven cm long. Their fur is lighter than other subspecies of leopards and their spots are rosette-shaped, both of which help to camouflage them in the snow.

Habitat loss, climate change, illegal wildlife trade, and deforestation have led these leopards to be the rarest cat in the world. It is estimated that less than 100 Amur leopards live in the wild. However, Amur leopards are being brought back from the brink of extinction due in part to the conservation efforts of zoos and the designation of protected lands in their natural habitat.

Articles sent to *Animal Keepers' Forum* will be reviewed by the editorial staff for publication. Articles of a research or technical nature will be submitted to one or more of the zoo professionals who serve as referees for AKF. No commitment is made to the author, but an effort will be made to publish articles as soon as possible. Lengthy articles may be separated into monthly installments at the discretion of the Editor. The Editor reserves the right to edit material without consultation unless approval is requested in writing by the author. Materials submitted will not be returned unless accompanied by a stamped, self-addressed, appropriately-sized envelope. Telephone, fax or e-mail contributions of late-breaking news or last-minute insertions are accepted as space allows. Phone (330) 483-1104; FAX (330) 483-1444; e-mail is shane.good@aazk.org. If you have questions about submission guidelines, please contact the Editor. Submission guidelines are also found at: aazk.org/akf-submission-guidelines/.

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While this is certainly a large undertaking for a volunteer position, the rewards of increasing the connection to the membership, aiding the passionate Committee and Program projects, and working to ensure that AAZK members and animal care professionals get access to the best possible opportunities to grow professionally makes the commitment well worth it.

One of the most common questions that I get when I speak to AAZK members is “What does the AAZK Board actually do?” In short, we endeavor to represent the views of the membership in categories such as professional development, conservation support, and communication. But that’s a simple summary of a multi-layered set of responsibilities and outlining those responsibilities will make the explanation far easier to understand.

The Board of Directors is composed of seven Professional Members who fill the roles of President, Vice President, and five Board Oversights. The Board Oversights are assigned 2-3 AAZK Committees and/or Programs by the AAZK President and are responsible for maintaining correspondence between a Committee or Program and the AAZK Board of Directors. This correspondence includes attending the monthly Committee or Program virtual meetings, regular e-mailing, and the submission of reports outlining the current state of various projects and tasks. Currently, these reports include monthly updates, as well as a larger Midyear Report submitted in April and an Annual Report submitted a few weeks prior to the National Conference.

These reports can contain a wide variety of content, but typically focus on the operations of a particular Committee or Program and the production of resources for the AAZK membership. If a Committee or Program has a member, Chair, or Vice Chair resign, the Oversight will report this to the Board and assist with recruiting and transitioning new members into the team. In addition, the production of resources such as helpful documents, live and virtual presentations, and publications on the website and in the *AKF* are all completed due to the hard work of AAZK’s Committees and Programs. Before work on these resources begins, and before it is presented to the membership, the AAZK Board of Directors sees and approves the materials to ensure that they meet the criteria and expectations of the Association and its members.

The approval of these various items takes place at a series of monthly meetings held by the Board of Directors. At these meetings, we discuss the topics and updates submitted in the reports, provide guidance to the Committees and Programs when needed, and grant approvals to the operational aspects of the Association including resource creation, new leadership on-boarding, and expenditures from the budget. Regular monthly meetings take place virtually and usually last 1-2 hours while the Midyear and Annual Meetings can take 1-2 days for the Board to properly review and discuss the actions of AAZK and its Committees and Programs.

When considering the full workload of serving on the AAZK Board of Directors, the time-commitment probably comes out to 8-10 hours during a typical month with 2-3 times that amount for the Midyear and Annual Meetings. While this is certainly a large undertaking for a volunteer position, the rewards of increasing the connection to the membership, aiding the passionate Committee and Program projects, and working to ensure that AAZK members and animal care professionals get access to the best possible opportunities to grow professionally makes the commitment well worth it.

Cheers,

Paul Brandenburger, AAZK President
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Amanda Westerlund
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NEW CONTENT ALERT...

The proceedings from the 2021 AAZK National Conference in Los Angeles, California are now available in AAZK C.O.R.E.

AAZK IS ALSO PLEASED TO UNVEIL THE NEW LOGO FOR AAZK C.O.R.E. —

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Vali

The Last of the Ailurids: History and adaptations of the red panda

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INTRODUCTION

As the last surviving members of the Ailuridae family, red pandas are a branch all their own. Researchers are still working out just where this family fits in the phylogenetic tree and are constantly reevaluating and refining their theories as new evidence comes to light. Currently, there are two species that make up this family, the Chinese red panda (*Ailurus fulgens fulgens*, previously *Ailurus fulgens styani*) and the Himalayan red panda (*Ailurus fulgens fulgens*). This makes Ailuridae one of the smallest extant mammalian families. However, this family was once widespread and successful, with fossil traces seen as early as the Late Oligocene to Early Miocene (18-20 million years ago). Though today's red pandas are only found in Nepal, Bhutan, China, Myanmar, and India (Thapa et al., 2018) their ancestors once lived in Europe and North America as well (Wallace, 2011). These species evolved in Order Carnivora and early Ailurids were true carnivores. However, today's pandas are obligate bamboo eaters. They rarely eat meat and instead rely on bamboo to make up the bulk of their diet (Pradhan, 2001). They are also arboreal, spending the majority of their time in the trees as opposed to being more terrestrial like their ancestors (Salesa et al., 2011). These lifestyle changes have caused red pandas to develop various attributes to help

them adapt to their new diet and habitat and now today's red pandas possess characteristics of carnivores as well as herbivores.

SKELETAL AND PHYSICAL DIFFERENCES

Overall, the red panda still retains several of its Carnivora characteristics. It has a simple stomach and short digestive tract, both of which are uncommon in herbivores. In comparison to Procyonids of similar size, such as raccoons and coatis, as well as early Ailurids, the red panda has a larger head, but the increased skull depth is believed to help increase their bite pressure, allowing for better grinding of plant material. Figure

1 shows the shortened skull depth as compared to one of the red pandas' most well studied ancestors, *Pristinailurus bristoli* (Woodruff, 2015). Each paw on extant red pandas contains five semi-retractable claws, a sign of it's arboreal lifestyle. The large postscapular fossa on the back of the shoulder blades is also likely an adaptation to allow the red panda to climb easier and make the forelimbs more supportive than the hind limbs (Roberts and Gittleman, 1984). Living red pandas still contain the signature lateral groove on their canine teeth and also have molar cusps which were present in early Ailurid species.

Comparatively, today's red pandas have smaller humerus/femur and humerus/

Figure 1. The shortened skull depth of *A. fulgens* compared to *P. bristoli* (Woodruff, 2015).





Figure 1.1 shows the smaller size of *A. fulgens* as compared to *P. bristoli* (Woodruff, 2015).

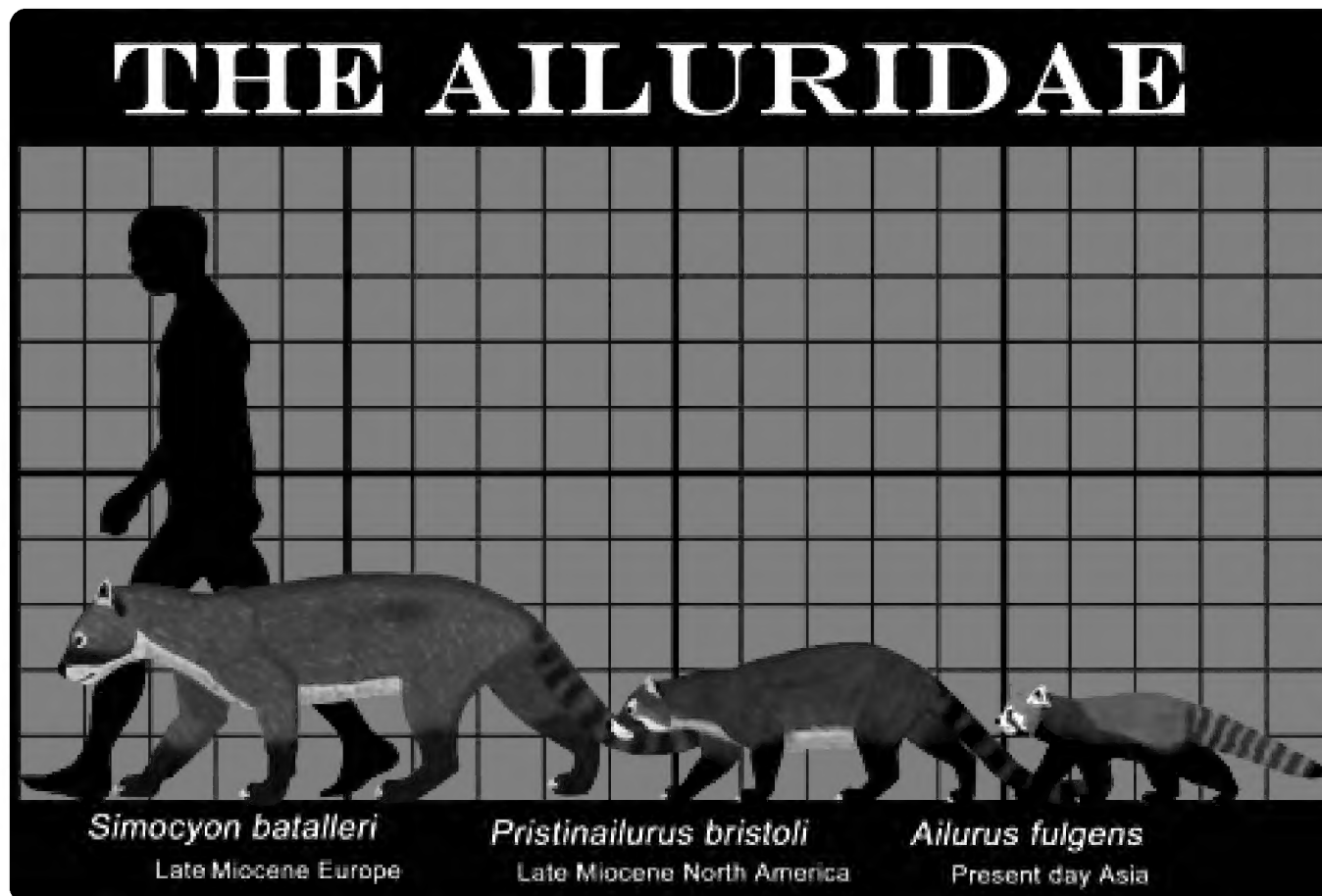


Figure 1.2 shows how the Ailuridae family has decreased in size over the millennia (Woodruff, 2015).

tibia ratios than their ancestors. This is another indicator that today's red pandas live a more arboreal lifestyle than early Ailurids (Wallace, 2011). Today's red pandas are so adept at climbing that they can descend head first down a tree. With this arboreal lifestyle came a smaller body size. Figures 1.1, and 1.2 show the size difference between Ailurids, note the much smaller size of *A. fulgens* (Woodruff, 2015).

While most carnivores have their left lung separated into three lobes, Ailurids have their left lung separated into only two lobes. This is in line with Procyonidae, Mustelidae (otters, ferrets, and wolverines), and Ursidae (bears). Ailurids have their right lung divided into four lobes. It is believed the reduction in lobes in the left lung leads

to a broadening of the thorax (Roberts and Gittleman, 1984). The purpose of this broader thorax has not yet been discovered since not all carnivores have the same corresponding number of lobes per lung. Another similarity between red pandas and Procyonids includes the structure of the larynx and the fact that the cuneiform cartilages are missing. The exact role of these cartilages is still unknown but it is believed that they help support the vocal cords and prevent aspiration. Both of these families also have a prominent entepicondylar foramen, or opening, on the humerus that allows for the median nerve to pass through. Other distant relatives of Ailurid and Procyonid, such as Mustelids and Feliforms (cats, hyenas, and mongooses), also have this foramen but the brachial artery passes through it as well as the median nerve. Ursids and

Canids (dogs), other families in Order Carnivora, don't have this foramen at all (Fisher, 2011).

RADIAL SESAMOID BONE

As the Ailurid species moved from being mainly terrestrial to arboreal, they developed an enlarged radial sesamoid bone in the Miocene that assisted with climbing. This enlarged wrist bone gave Simocyon, early members of the Ailurid family, a functioning pseudthumb. Since dentition shows that Ailurids were still partaking in a mainly carnivorous diet at the emergence of the pseudthumb, researchers surmise that the enlarged radial sesamoid bone developed as a climbing aid. Extinct Ailurids had a smaller radial sesamoid bone than today's red pandas, supporting the theory that this developed as a climbing aid (Wallace, 2011). However, this pseudthumb was a preadaptation and also assists with grabbing fruits, stems, and leaves (Salesa et al., 2006). Figure 2 demonstrates how red pandas use this preadaptation to assist them with holding and grabbing (voltagegate, 2007).

The giant panda, a member of the Ursidae family, also developed an enlarged radial sesamoid bone, however, it did so independently from the red panda, a member of the Ailuridae family. In relation to the other bones in the wrist, the giant panda's radial sesamoid is larger than the red pandas. Since the giant pandas don't do as much climbing and have been strict herbivores longer than the red panda, researchers theorized that this enlarged bone evolved to assist the giant pandas with grabbing and holding, which was a preadaptation in the red panda (Salesa et al., 2006).

The genes responsible for this enlarged radial sesamoid bone in both the red and giant pandas are believed to be the *DYNC2H1* and *PCNT*. Both of these genes contribute to limb development and have undergone adaptive convergence in both of these species which diverged 43 million years ago (Hu et al., 2017).

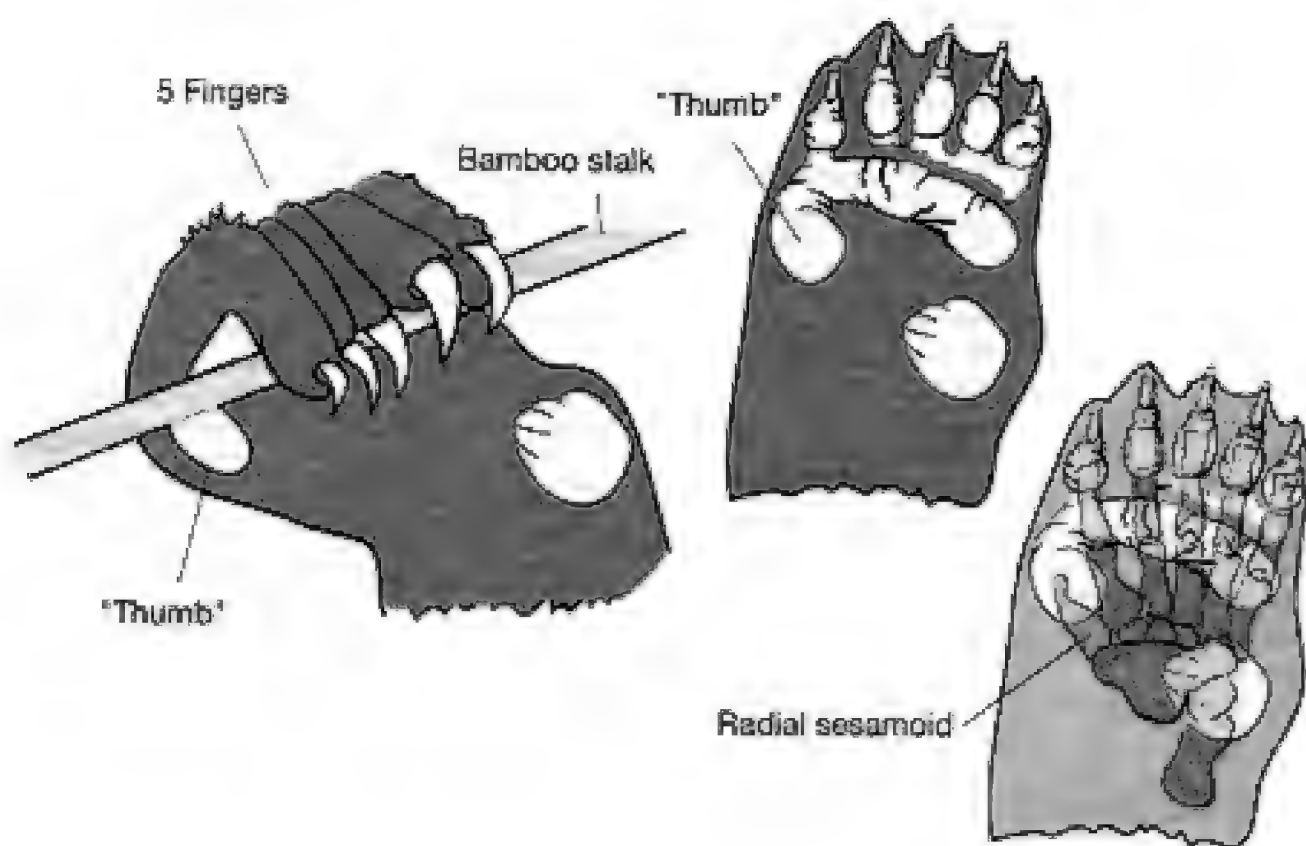


Figure 2. The use of the radial sesamoid bone in a red panda paw (voltagegate, 2007).

UMAMI TASTE RECEPTOR

Red pandas are the only species aside from humans and Old World apes and monkeys which are known to be able to taste artificial sweetener (Goldman, 2014). In exchange for this taste, red pandas lost what is known as the umami taste. Umami is also referred to as “savory” and detects tastes in substances such as monosodium glutamate, 5′-monophosphates, L-amino acids, and 5′-ribonucleotides (Yamaguchi, 1979; Sato et al., 2012). The gene responsible for the umami taste is known as the *TAS1R1* gene (Hu, 2017). *TAS1R1* encodes for the T1R1 protein, which is one of three type-1 taste receptors and the one used by carnivores to detect the best tasting meat (Sato et al., 2012; Li, 2009; Yarmolinsky, 2014). As red pandas began to adapt more of a herbivorous diet, they pseudogenized the *TAS1R1* gene. Instead of the “umami” heterodimer T1R1/T1R3, red pandas possess the heterodimer for “sweet”, T1R2/T1R3. The protein for the “sweet” heterodimer is encoded by the gene *TAS1R2* (Li, 2009). Herbivores utilize the ability to taste “sweet” to detect carbohydrates in the plants they ingest. The ability to taste aspartame, or artificial sweeteners, is a recent evolutionary development. The giant panda has a diet very similar to that of

the red panda and may have evolved their “sweet” taste receptors in a response to their high carbohydrate diet as well.

GUT MICROBIOMES

There are three species of obligate bamboo eaters: the red panda, the giant panda, and the bamboo lemur (*Haplemur griseus*). Each are members of a different phylogenetic family (Hu, 2017). These three species share 48 low-abundance operational taxonomic units (OTUs). The bamboo lemur and its sister species, the ring-tailed lemur (*Lemur catta*) only share eight OTUs (McKenney et al., 2017). OTUs are sequences of similar genomic data on a DNA sequence and are used to determine relatedness among species (Galimberti et al., 2012).

Each of these species also has an increased amount of cyanide degradation enzymes, something that is found in herbivores but not carnivores. These enzymes help to break down the cyanide in the bamboo leaves (Zhu, 2018). Since each species developed independently of the others but yet all share similar characteristics, researchers believe that their diet of bamboo may have driven some of the phenotypic evolution.

CONCLUSION

Despite the fact that there are only two living species left, Ailuridae is a complex and old phylogenetic family. Even though Ailurid species were once widespread across North America, Asia, and Europe, there is very little fossil evidence available to explain their evolutionary changes, or extinctions, over the millennia. So far, most of the prehistoric Ailurid species are only represented by fossilized teeth. The most well represented and well researched species, *P. bristoli*, is unlike any of the other extinct as well as extant species of ailurids that are currently known. There are still many “missing pieces” needed to connect the various members in the Ailuridae family. Even with continuing advances in genetics and phylogeny, researchers still debate over where Ailuridae fits in Order Carnivora.

Many of Ailuridae’s genetic adaptations are also seen in species which are members of other phylogenetic families. This is evidence of convergent

Delilah





Joe

evolution and provides researchers with new evolutionary information to analyze. This is also one of the few families that has transformed from a carnivorous diet to that of an obligate herbivore. That alone begets various evolutionary mysteries for researchers to study. Preserving this unique species also preserves an irreplaceable bank of information that can help scientists better understand adaptations and convergent evolution. Losing this endangered species would be losing a species full of distinctive attributes, ranging from taste receptors to skeletal design. As scientists decode more and more genomes and find more genetic links, we will be able to learn even more about how animals, including ourselves, adapt and evolve in an ever-changing environment. The red panda has proven for thousands of years that it's able to modify itself and survive, even going to such extremes as completely changing its diet. This cute ball of fluff may hold the key to answering the big question: what really drives evolution? 🐼

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All photos courtesy of Laura Smyth.

Kumari





Linda

Could It Get Any Worse? Battling an outbreak of avian cholera amidst a pandemic

Wendy Zolinski
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INTRODUCTION

Zookeeping is rarely boring, with every day presenting a challenge of some kind. Some challenges can be minor, like the infamous drain that's not at the lowest point of the pool or an animal that takes too long to shift off exhibit. Other challenges, however, can be large, complex, and presented without warning. This article discusses an unprecedented outbreak and management of a bacterial pathogen at Audubon Zoo in New Orleans, Louisiana and seeks to bring awareness to other

zoos that may experience similar circumstances in the future.

ARRIVAL OF AVIAN CHOLERA

Each winter, millions of birds migrate to coastal Louisiana, including large numbers of waterfowl (Whitaker, et al, 2019). Among these species is the Black-Bellied Whistling Duck (*Dendrocygna autumnalis*) (hereafter abbreviated as "BBWD"), with some flocks overwintering at Audubon Zoo in New Orleans. Flocks of this species can reach up to one thousand individuals in

size (The Cornell Lab, 2019), and can inundate open-topped aquatic exhibits at the zoo. In any normal year, the local migratory population can be a mild nuisance as they defecate on visitor pathways and consume food meant for collection animals. However, in a year that included a COVID-19 pandemic, rampant wildfires around the world, and Kanye West running for president of the United States, Audubon Zoo also experienced an unusual 2020. That year, the migratory BBWDs put the health of the captive avian collection at major risk and tested the resolve of the Audubon bird team.

In November of 2020, animal staff began finding deceased wild BBWDs in and around the zoo's larger lagoons on a daily basis. Deceased individuals were submitted to the zoo's animal hospital for necropsy, but no obvious causes of death were apparent. As the number of dead whistling ducks found daily increased, staff became concerned about the potential of a contagious disease. The zoo's veterinary team conferred with the Louisiana Department of Wildlife and Fisheries' state wildlife veterinarian who confirmed via



Figure 1: Flock of wild Black-Bellied Whistling Ducks in South American Pampas exhibit. 18 February 2021

Common Name	Scientific Name	South American Exhibit (n)	Free Flight Aviary (n)	American Flamingo Lagoon (n)	Prior Contact with Wild BBWDs	Cholera Related Mortality (n)
Black Swan	<i>Cygnus atratus</i>	0	0	2	Yes	0
Chiloe Widgeon	<i>Anas sibilatrix</i>	1	0	0	Yes	0
Coscoroba Swan	<i>Coscoroba coscoroba</i>	1	0	0	Yes	0
Crested Screamer	<i>Chauna torquata</i>	2	0	0	Yes	0
Domestic Goose	<i>Anser anser</i>	1	0	0	Yes	0
Fulvous Whistling Duck	<i>Dendrocygna bicolor</i>	15	5	0	Yes	0
Gadwall	<i>Mareca strepera</i>	1	0	0	Yes	0
Hooded Merganser	<i>Lophodytes cucullatus</i>	0	2	0	No	2
Hybrid Whistling Duck	<i>Dendrocygna</i>	2	2	0	Yes	0
Magpie Goose	<i>Anseras semipalmata</i>	0	2	0	No	0
Ringed Teal	<i>Callonetta leucophrys</i>	0	3	0	No	1
Rosybill Pochard	<i>Netta peposaca</i>	8	1	0	Yes	0
White-Faced Whistling Duck	<i>Dendrocygna viduata</i>	6	2	0	Yes	0

Table 1

liver cultures that the local migratory population of BBWDs was carrying the bacterial pathogen *Pasteurella multocida*, which causes the disease known as Fowl or Avian Cholera.

Pasteurella multocida is highly contagious and spreads via environmental contamination. The disease causes rapid mortality in birds without any prior signs of illness. Birds can die as quickly as 6-12 hours after infection, although 24-48 hours is more typical (Leotta, et al., 2006). On several occasions, staff observed the vitality of wild ducks decline over just a few minutes with convulsions, erratic flying and lethargy often preceding death.

According to Friend and Franson (2001), infection of *P. multocida* can occur through ingestion of contaminated food or water, contact with an infected bird or carcass, or contact of the bacteria with mucosal membranes or open wounds. Avian cholera can be transmitted via contaminated water sources, aerosolized water droplets, infected equipment (boots, food and water bowls, etc.), and predators and/or scavengers carrying

carcasses of diseased birds. Highest concentrations of the bacteria have been found at the surface of the water column, where most species of waterfowl spend much of their time. *Pasteurella multocida* can also live for several weeks in the water and soil. The best methods of combating this pathogen include effective biosecurity, antibiotic treatment, and depopulation (Sander, 2019).

On 19 November 2020, the first avian cholera-related mortality in a collection animal at the zoo was recorded in an American Flamingo (*Phoenicopterus ruber* [Phoenicopteriformes]). With thousands of whistling ducks occupying and possibly contaminating the large lagoons that housed waterfowl, the bird staff at Audubon Zoo had to act quickly to protect other potentially susceptible collection animals from this pathogen.

QUARANTINE

Waterfowl (Anseriformes) are kept in three exhibits at Audubon Zoo: a free-flight aviary, the South American Pampas Exhibit, and the American Flamingo Lagoon. The wild BBWDs tend to inhabit the adjacent South American Pampas and

American Flamingo exhibits; the aviary is located just across the guest pathway from the Flamingo lagoon. The aviary was not initially considered a high-risk area since the wild whistling ducks did not have direct access to or contact with collection animals as they did in the other two exhibits. For a list of waterfowl species represented in each exhibit, see Table 1.

On 8 December 2020, the decision was made by the veterinary staff and bird department to sequester and transfer all collection Anseriformes from the South American Pampas and American Flamingo Lagoon exhibits to quarantine locations to minimize contact with wild BBWDs and the risk of infection. A new mesh-enclosed outdoor holding area was built to accommodate the waterfowl that needed to be quarantined. In order to sequester the birds in a timely manner, the most efficient and reasonable location for the holding was adjacent to the American Flamingo Lagoon. Once the holding area was completed, staff began catching the 37 individuals, representing 13 Anseriformes species, from the South American and Flamingo exhibits. This



Figure 2: Audubon Zoo South American Pampas exhibit. 29 April 2021



Figure 3: Audubon Zoo American Flamingo Lagoon. 29 April 2021

proved to be an enormous challenge, as these exhibits are each approximately one acre in size. It took the bird and herpetology departments several days to successfully capture and relocate all birds. The aviary was also closed during this time to prevent any guests from potentially tracking *P. multocida* into the exhibit on their shoes.

The first attempt at catching waterfowl in the South American Pampas exhibit sought to catch as many individuals as possible in one fell swoop. A keeper entered the exhibit and fed the ducks far away from the water, while the rest of the team moved in behind the group of ducks along the shore with long

stretches of shade cloth to corral the ducks into a corner of the exhibit. Once corralled, staff would then come in with nets to catch up birds. This approach was successful for exactly one attempt. Several ducks were captured during this first try, but the birds quickly lost trust and future attempts ended with all ducks fleeing to the safety of the water. This left staff with one option: get in the water and herd the ducks up on land.

Each morning for about eight days, staff suited up in scrubs, gloves, and boots, kayaked around the lagoon, and herded ducks onto land where more staff awaited with nets. With each passing day the collection flock

got a little smaller, with keepers slowly chipping away at getting birds to the quarantine location. However, once the numbers dwindled to the last half dozen individuals, things got trickier. The remaining ducks, most of which were Fulvous Whistling Ducks (*Dendrocygna bicolor*), began to dive and swim away underwater and the “kayak encouragement” method became quite comical. Half the zoo likely heard keeper staff groaning as ducks continued to evade them by diving under the kayak and resurfacing several meters away. To make matters worse, some of these ducks, despite being pinioned, managed to fly out of the exhibit. Staff quickly responded to the escapes, and all ducks were safely recovered. Eventually, the remaining individuals were herded up onto land, netted, and transferred to the quarantine location. Honorable mention must go to the single African Shelduck (*Tadorna cana*) for causing the most frustration among staff and being the last animal captured. Two Abyssinian Ground Hornbills (*Bucorvus abyssinicus*) were also moved from their African Savannah exhibit into quarantine as they had both been seen playing with deceased whistling ducks at the water’s edge.

BIOSECURITY AND MANAGEMENT

Once all waterfowl were isolated, keeper routines were modified to accommodate the 39 sequestered individuals. It was decided that keepers would care for the sequestered animals as their own separate “routine”, while other routines remained the same. Bird keepers working in the quarantine areas were required to wear scrubs, gloves, and designated boots and were not allowed to handle birds outside quarantine locations. Biosecurity measures were also put in place in all bird exhibits and holding areas throughout the zoo. Specific boots were used in areas suspected to have been contaminated with cholera and Vircon™ S Disinfectant and Virucide footbaths were placed in every section. Bird staff did not handle any deceased BBWDs. Trapping of

raccoons was increased to minimize the movement of duck carcasses around zoo grounds. All incoming and outgoing bird transactions were put on hold as the department worked to contain the outbreak.

By the third week of December, the numbers of deceased whistling ducks encountered had substantially declined, even though the migratory flock was still present in the zoo's lagoons. The veterinary team decided that it was safe to return collection waterfowl to their exhibits. Staff were relieved that this process was coming to an end, until a Hooded Merganser (*Lophodytes cucullatus*) in the collection was found deceased in the free flight aviary on 19 January 2021. While this individual was geriatric and her health had been in decline, no birds were returned to their exhibits until necropsy and histopathology test results came back. As the bird team anxiously awaited the test results, a second Hooded Merganser in the aviary died suddenly on 30 January 2021. This was soon followed by the death of a Grey-Necked Wood Rail (*Aramides cajaneus*) and a Ringed Teal (*Calonetta leucophrys*) on 2 and 4 February 2021, respectively. Positive test results for *P. multocida* came back for all deceased individuals in the aviary. The jump from waterfowl to a rail (Gruiformes) was surprising, but not nearly as unexpected as the death of a Bali Mynah (*Leucopsar rothschildi*) (Passeriformes) from avian cholera on 6 February 2021. On 7 February 2021, all remaining waterfowl in the aviary were sequestered to the zoo's animal hospital.

Following the death of the second Hooded Merganser, the aviary was treated as another quarantine area. Scrubs and gloves, in addition to designated boots and footbaths, were required at all times and food pans were thoroughly disinfected before returning to the kitchen. Waterfalls and streams in the aviary were turned off and emptied to minimize the risk of water contamination and keepers provided birds with water bowls instead. In late February 2021, the mortality rate among wild BBWDs

increased dramatically, and zoo staff were retrieving dozens of deceased ducks from the zoo's lagoons each day, with some days totaling as many as 60-80 individuals. Other parks in the greater New Orleans area were also experiencing high mortality of waterfowl at this time.

On 21 February 2021, veterinary staff prescribed an antibiotic treatment for all birds in the free flight aviary, which keepers added to the water bowls twice daily for ten days. Birds housed in an enclosed off-exhibit breeding facility at the zoo were also treated with the antibiotic due to their lack of exposure to the bacteria and potential susceptibility. The last cholera-related death of a collection animal occurred in an American Flamingo on 1 March 2021.

Mortality among wild BBWDs continued until the ducks began to leave zoo grounds around the beginning of March 2021. Deaths became less frequent, and staff were hopeful that their migration would take this disease with them. Veterinary staff waited four weeks from the last recorded whistling duck death on zoo grounds and confirmation from the state wildlife veterinarian that mortality had also ceased elsewhere

before officially lifting the quarantine on 26 March. Birds were returned to their exhibits over the subsequent days, and staff were able to breathe a sigh of relief as husbandry routines returned to normal.

DISCUSSION

Despite experiencing some mortality among Audubon Zoo's bird collection, none of the collection waterfowl that had been directly exposed to the wild ducks while housed in the outdoor lagoons or in the quarantine space adjacent to the infected exhibits experienced mortality or declines in health. A recent study by van Dijk et al. (2021) suggests that herd immunity led to the fadeout of an avian cholera outbreak in Northern Common Eiders (*Somateria mollissima*) in Canada. Antibodies created in response to natural exposure to *P. multocida* likely caused an adaptive immune response in the eiders that led to decreased mortality in the population. It's possible that collection waterfowl at Audubon Zoo housed in open exhibits had prior exposure to *P. multocida* and had developed immunity to the pathogen. In contrast, birds living in the free flight aviary would have had little or no prior direct exposure and therefore may have been more susceptible to the disease.

American Flamingo Lagoon. 14 August 2021



Audubon Zoo's bird and veterinary teams managed the outbreak appropriately and aggressively, but hindsight is, pun intended, 20-20. Due to their unknown susceptibility to the bacteria at the time, it may have been beneficial to isolate all collection waterfowl sooner, including those that were not directly exposed to the wild ducks. We may have also considered sequestering other wetland birds such as ibis, rails, gallinules, and flamingos, despite them being less frequently affected by *P. multocida* than Anseriformes (Northeast Wildlife Disease Cooperative, 2020). However, finding a safe location for that number of individuals in a very short period of time would have been challenging with limited holding space available. Additionally, catching the ducks out of the large lagoons can be made easier by installing a corral in the exhibit, feeding them there, and enclosing them in the smaller space for a more effective catch-up in the future.

While this was certainly a difficult circumstance to say the least, it may not be an isolated incident. It is possible that the infection could return in subsequent years not only to Audubon Zoo, but to other zoos along the Gulf Coast and potentially the Mississippi flyway. Since the globalization of avian cholera has been a direct result of

infected migratory flocks (Petruzzi et al., 2018), zoos that have a yearly presence of migratory birds should exercise caution, increase observations of these birds, and take note of any wild bird deaths to ensure the health and safety of their collection. This experience has better prepared Audubon Zoo for similar recurrences and may be useful to other institutions if they experience comparable events in the future.

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The AAZK Professional Development Team is pleased to announce the call for Topical Workshops for the 2022 AAZK National Conference hosted by the AAZK Toronto Chapter.

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Latin America members or non-members submitting abstracts in consideration for presentation at the 2022 AAZK National Conference in Toronto may submit in both Spanish and English. Canadian members or non-members submitting abstracts in consideration for presentation at the 2022 AAZK National Conference in Toronto may submit in both French and English. Questions should be directed to pdcaazk.org with ATTN: Topical Workshop as part of the e-mail subject.

Workshop Format

Workshop subjects should be in-depth explorations of animal health, animal management, taxa-specific husbandry, conservation, and keeper professional development. Workshops should be two hours in length. Subjects that require more than two hours should be submitted as “Part One” and “Part Two”. Abstracts should be no more than 250 words and should focus on the main theme of the workshop, while also keeping the conference theme in mind.

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On Board with AAZK

Articles from the AAZK Board of Directors covering thoughts, news, and tales from the Association

Ellen Vossekui
Zoo Specialist – Ochsner Park Zoo
AAZK Board of Directors

In 2009, at the annual AAZK conference, I attended a workshop that laid out all the different national committees that members could be a part of. After the workshop, I approached the chair of the Professional Development Committee and inquired if they were looking for new members. I had no idea what I was getting myself in to, or the places I would end up.

I served on the PDC from 2009 to 2017, as a committee member, vice-chair, and chair. The last ten years have seen an evolution in conference programing, starting in San Diego in 2011 with the new topical workshop format and Certificate Courses in 2014. It's been an exciting

time to be involved in National AAZK! What's more rewarding than being a part of moving our organization forward, and expanding the resources we can offer our members? My time on PDC represented my favorite parts of being involved in AAZK; networking and learning!

In 2017, I was asked to join the AAZK Board of Directors after another board member stepped down. While it had always been an eventual goal of mine to serve on the AAZK BoD, I was incredibly nervous about taking on such an important role. I am not at all a "Type A" personality, and deadlines and details are not among my strengths. At least, they weren't when I started participating in

National AAZK. But that's the thing about this organization; it helps to identify and mold leaders in the animal care field, and give them skills they might not acquire in a keeper position.

Because of my work on PDC, I was assigned to the Education team as my area of oversight. At that time, the Education team consisted of both PDC and the International Outreach Committee (IOC). Both committees are dedicated to providing resources and networking opportunities to AAZK members, and our colleagues down in Latin America.

The International Outreach Committee (IOC) is a young committee, but that hasn't stopped them from working exhaustively to fulfill their mission statement of discovering the professional development needs of the international keeper community, and provide education and mentorship opportunities. Their focus has been primarily in Latin American countries. The two founding pillars of IOC have been the Latin American Travel Grant (LATG), and the Capacity Building Programs (CPB). The LATG provides funds for an animal keeper from a Latin American country to travel to an AAZK conference, allowing them to network and learn best practices in North American animal care. The CBP's are mini-conferences that are held at institutions in Latin America. Members of IOC present on a variety of subjects, and organize presentations by local animal care staff on their innovative practices. During the last 18 months of COVID lockdowns, IOC has transitioned into doing monthly online forums, attended by colleagues from more than 15 different countries. Their most



recent project was the development of a new membership category for keepers from Developing Nations. This new category of AAZK membership is priced to match the comparative cost of living and salaries of animal care staff in these countries. This allows IOC to offer AAZK memberships to



almost 100 Latin American keepers via their Chapter Sponsorship Program. Interested in what IOC is doing and want to learn more? E-mail IOC@azk.org.

In 2019, the Professional Development Committee evolved into the Professional Development Team, under the direction of the brand new Director of Professional Development. That transition marked my tenth year of being involved with professional development and conference planning for National AAZK. With PDT being moved outside of the umbrella of the Board of Directors, the AAZK Resource Committee (ARC) was added to the Education team.

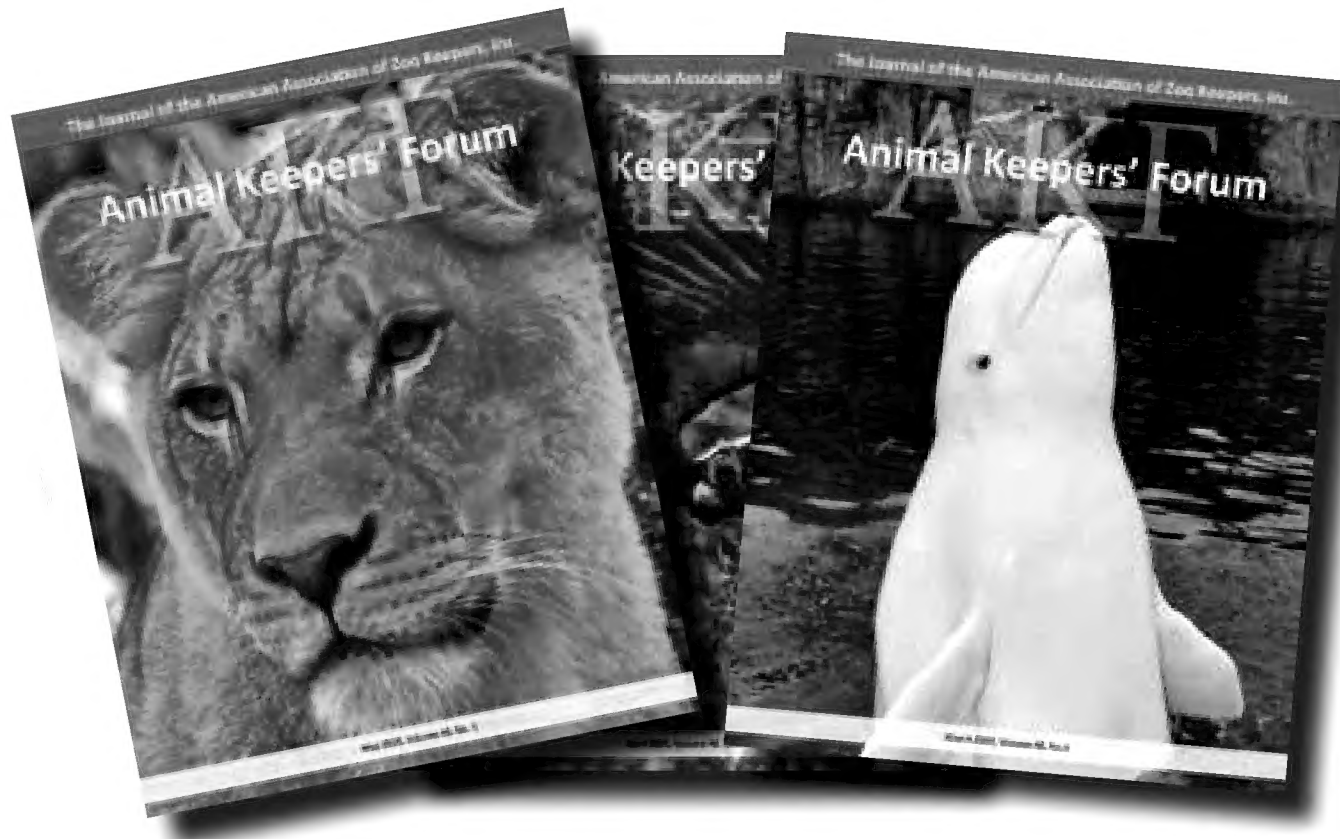
ARC is also a relatively new AAZK committee that has been exceptionally busy since its inception. The mission

of ARC is simply to provide resources to Chapters and members, so that they can elevate the field of animal care as a whole. A functional and thriving AAZK Chapter requires knowledgeable leaders, and the Tools for Running a Successful Chapter workshop was one of the original resources created by ARC for this purpose. In addition to conference content, ARC also organized the Chapter Marketplace for Chapters to display and sell their amazing merch! ARC has created a wealth of written manuals on Chapter function, finances, member recruitment, and the re-charter process. ARC also strives to provide resources for individual members of AAZK, and has recently been instrumental in supporting new content on AAZK C.O.R.E, the revamped online learning platform. Interested in learning more about ARC? E-mail ARC@azk.org.



My time on the AAZK Board of Directors will end at the 2021 Conference in Los Angeles. When I attended that conference workshop in 2009, there's no way I could have pictured the journey it would take me on. I have been able to be a part of one of the biggest periods of evolution in National AAZK, and it's been so rewarding to know that I've contributed even a tiny bit to that advancement. My involvement in AAZK has allowed me to meet some of the most talented and passionate people in our field, and not only that, to call those people my friends. Every time I attend a committee meeting, or a conference, I am blown away by the incredible work that AAZK members are doing, both in their institutions, and on behalf of AAZK. While my term on the BOD may be drawing to a close, I'll never be far away from AAZK and the work that continues to inspire me. 🐘

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